

FIG. 1

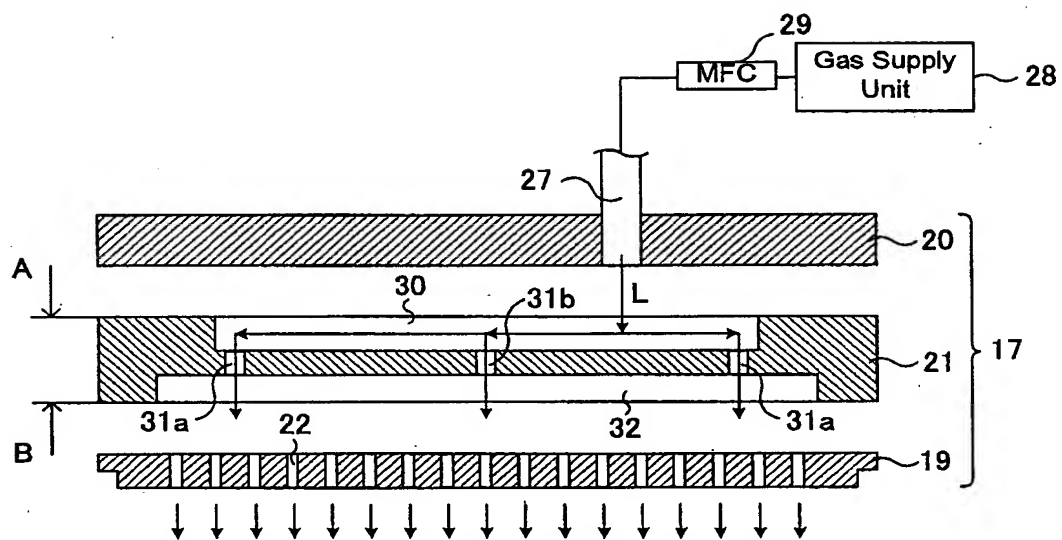


FIG.2

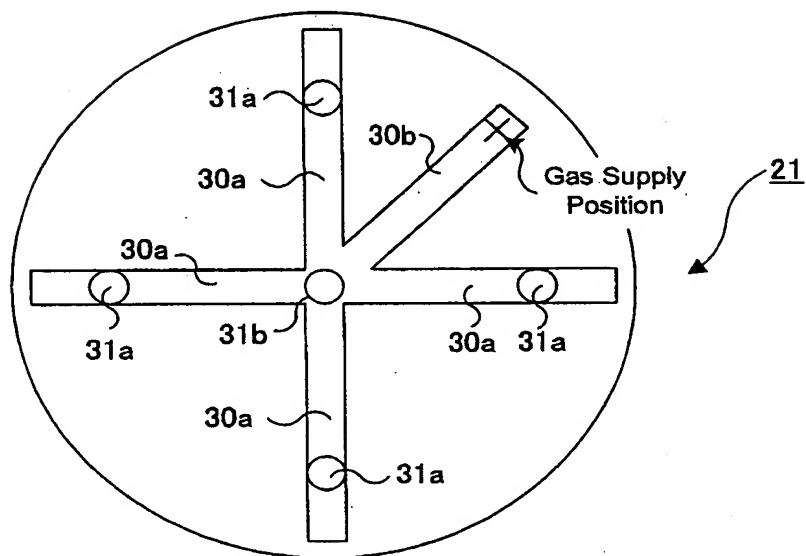


FIG. 3 Diagram As Seen From Arrow A

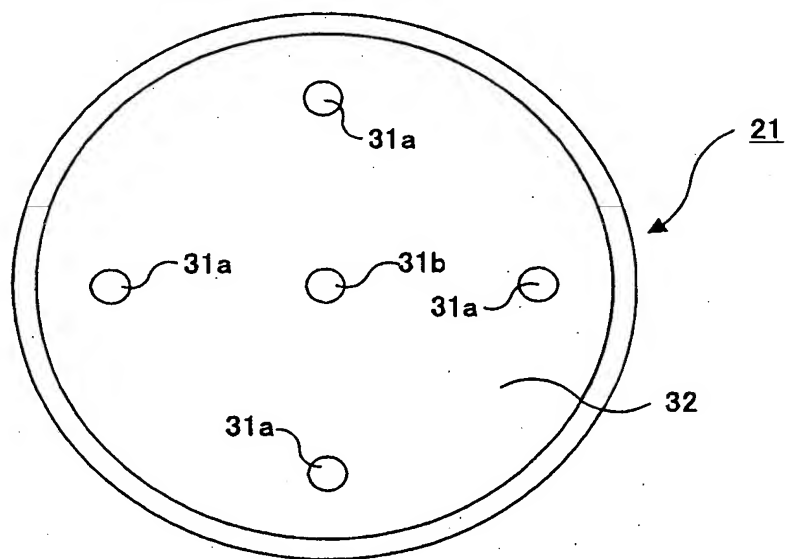


FIG. 4 Diagram As Seen From Arrow B

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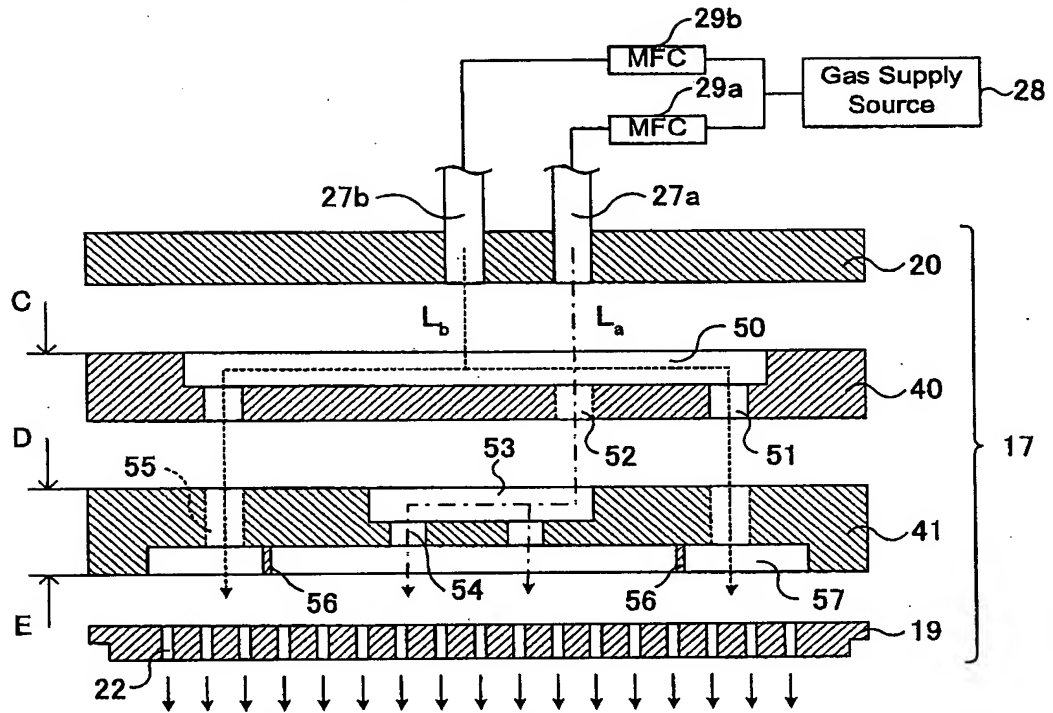


FIG.5

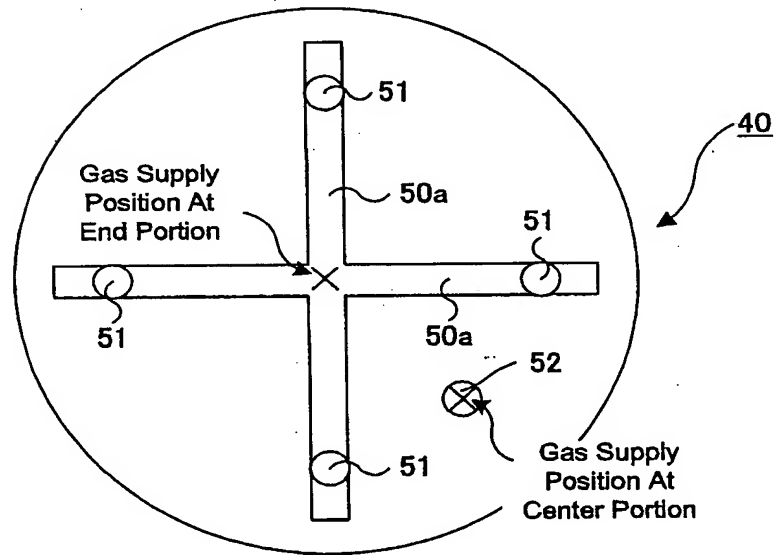


FIG.6

Diagram As Seen From Arrow C

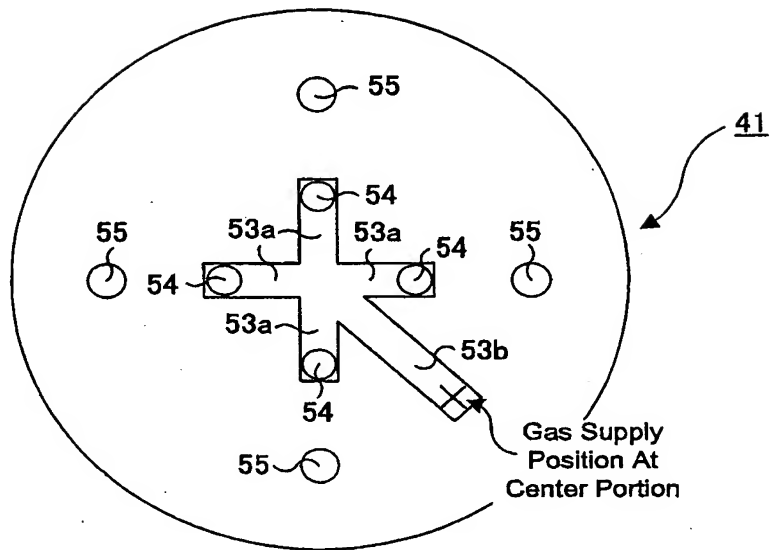


FIG. 7 Diagram As Seen From Arrow D

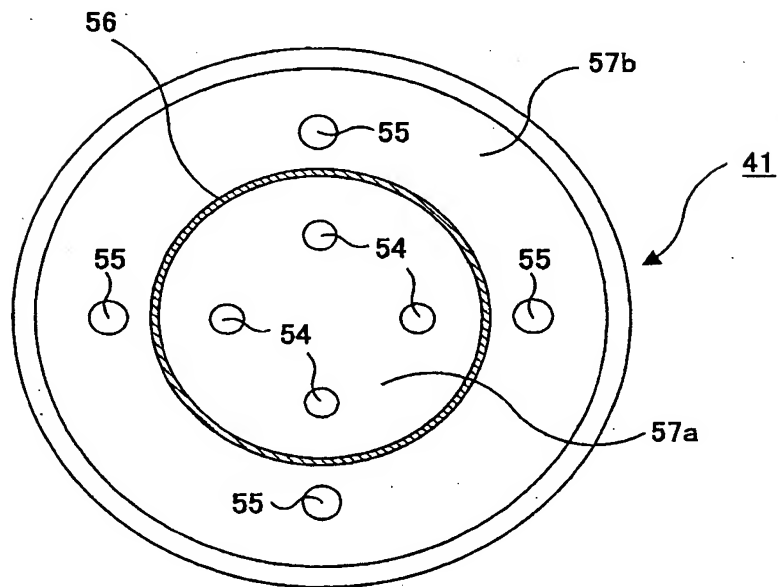


FIG. 8 Diagram As Seen From Arrow E

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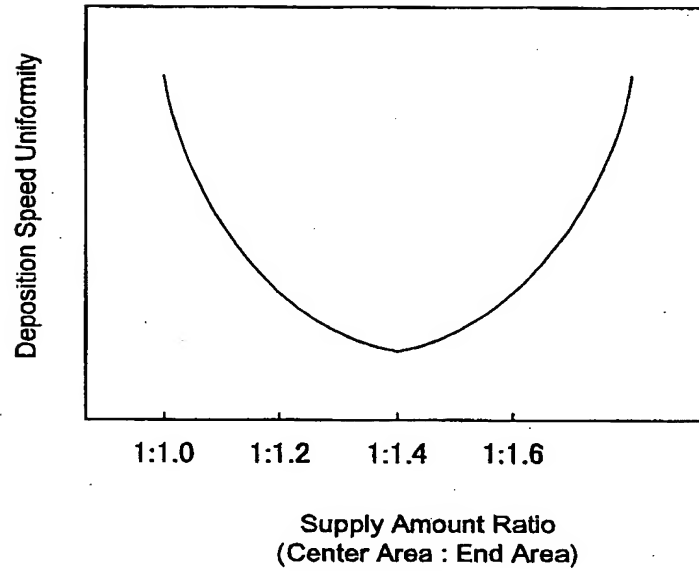


FIG. 9

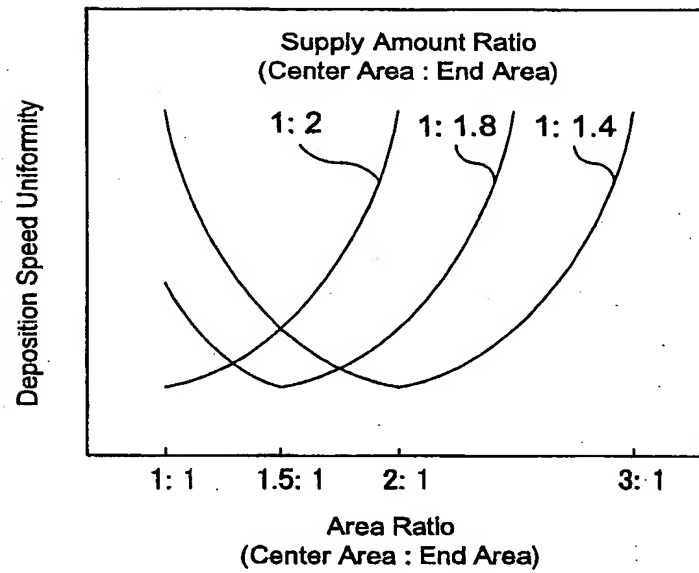


FIG. 10

FIG. 11

| Gas Species | SiH ₄ /O ₂ /Ar | SiF ₄ /SiH ₄ /O ₂ /Ar | SiH ₄ /CH ₄ /Ar | SiH ₄ /N ₂ /Ar | SiH ₄ /N ₂ /CH ₄ /Ar | C ₆ F ₆ /Ar | 3MS/(Ar or He) | 3MS/O ₂ /Ar |
|----------------------------|--------------------------------------|--|---------------------------------------|--------------------------------------|---|-----------------------------------|----------------|------------------------|
| Gas Flow Rate (sccm) | 200/500/50 | 120/80/400/50 | 10/20/200 | 45/175/200 | 10/10/15/200 | 30/200 | 60/200 | 80/15/200 |
| Center Area : End Area | 1:1 | 1:4 | 1:4 | 1:2 | 1:4 | 1:1.5 | 1:0.25 | 1:0.25 |
| Pressure (Pa) | 0.25 | 1.0 | 2.0 | 1.0 | 2.0 | 30 | 30 | 50 |
| Upper Electrode Power (kW) | 2.7 | 2.7 | 1.0 | 1.0 | 1.0 | 1.0 | 0.6 | 0.6 |
| Lower Electrode Power (kW) | 1.0 | 1.0 | 0.5 | 0.5 | 0.5 | 0.2 | 0.1 | 0.1 |
| Substrate Temperature (°C) | 350–390 | 350–390 | 350–390 | 350–390 | 350–390 | 350–390 | 250–400 | 250–400 |

| | Substitutable Gases |
|--|--|
| SiH ₄ | TEOS, Si ₂ H ₆ |
| SiF ₄ | SiH ₂ F ₂ , Si ₂ F ₆ |
| CH ₄ | C ₂ H ₆ , C ₃ H ₈ , C ₂ H ₄ , C ₂ H ₂ |
| C ₆ F ₆ | CF ₄ , C ₂ F ₆ , C ₃ F ₈ , C ₅ F ₈ |
| N ₂ | N ₂ O, NO |
| O ₂ | N ₂ O, NO, CO, CO ₂ , O ₃ |
| (CH ₃) ₃ SiH, Trimethylsilane | (CH ₃) ₃ SiH ₃ , (CH ₃) ₂ SiH ₂ , (CH ₃) ₄ Si, DMDM, TMCTS, V ₃ D ₃ , HMDSO, OMCATS |

DMDM: Dimethyldimethoxysilane
 TMCTS: 1,3,5,7-Tetramethylcyclotetrasiloxane
 V₃D₃: 1,3,5-Trimethyl-1,3,5-trivinylcyclotrisiloxane
 HMDSO: Hexamethoxydisiloxane
 OMCATS: Octamethylcyclotetrasiloxane

FIG.12

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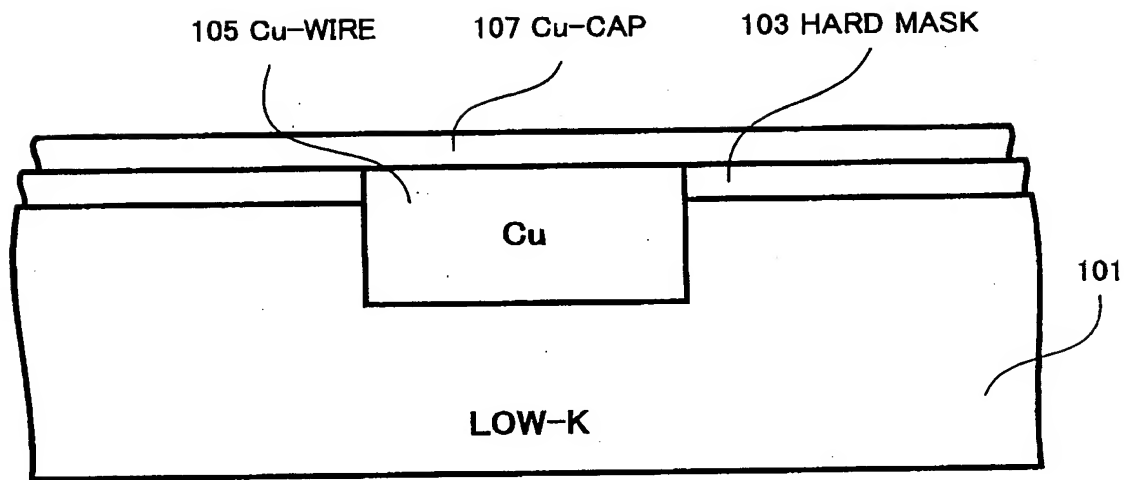


FIG.13

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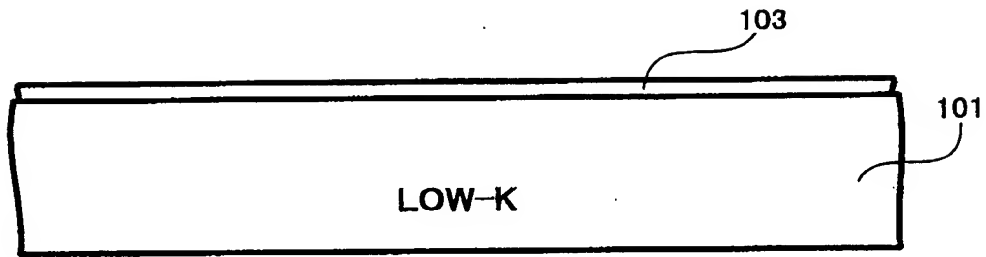


FIG.14A

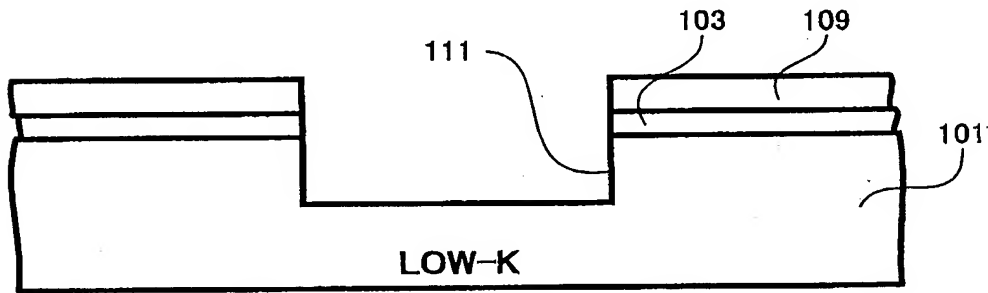


FIG.14B

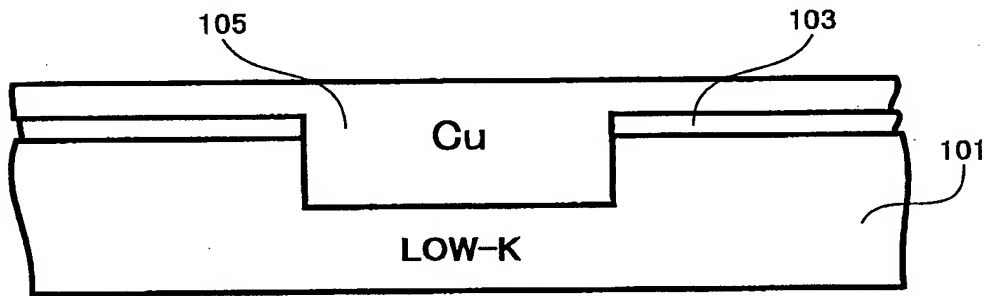


FIG.14C

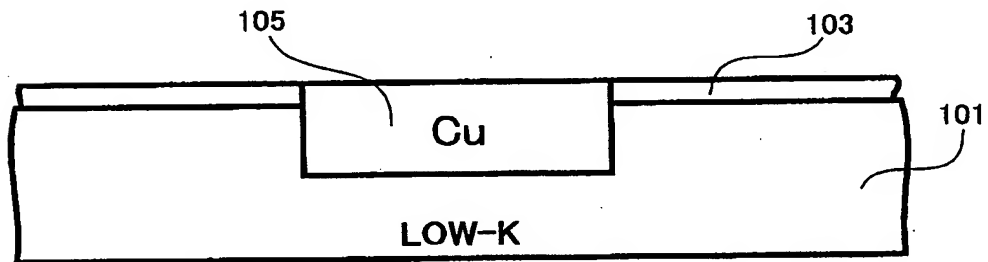


FIG.14D

| He(C/E) (sccm) | HN3(C/E) (sccm) | O2(C/E) (sccm) | T/B (w) | Pressure (Torr) | Temperature (°C) | Time (minute) | Thickness (Angstrom) | Unification (1sigma%) |
|-------------------|--------------------|-------------------|------------|--------------------|---------------------|------------------|-------------------------|--------------------------|
| 300/300 | 40/40 | --/-- | 700/0 | 2.9 | 350 | 1.0 | 500 | 2.5 |
| 150/150 | --/-- | --/-- | 400/0 | 4.5 | 350 | 1.5 | 500 | 2.1 |
| 150/150 | --/-- | 7.5/7.5 | 400/0 | 4.5 | 350 | 9.0 | 5000 | 4.0 |

FIG.15

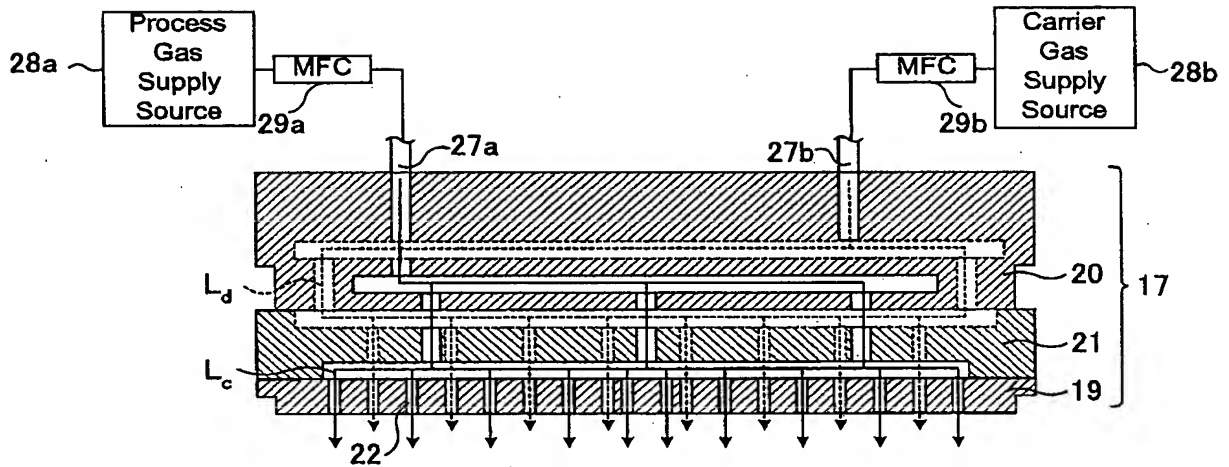


FIG. 16

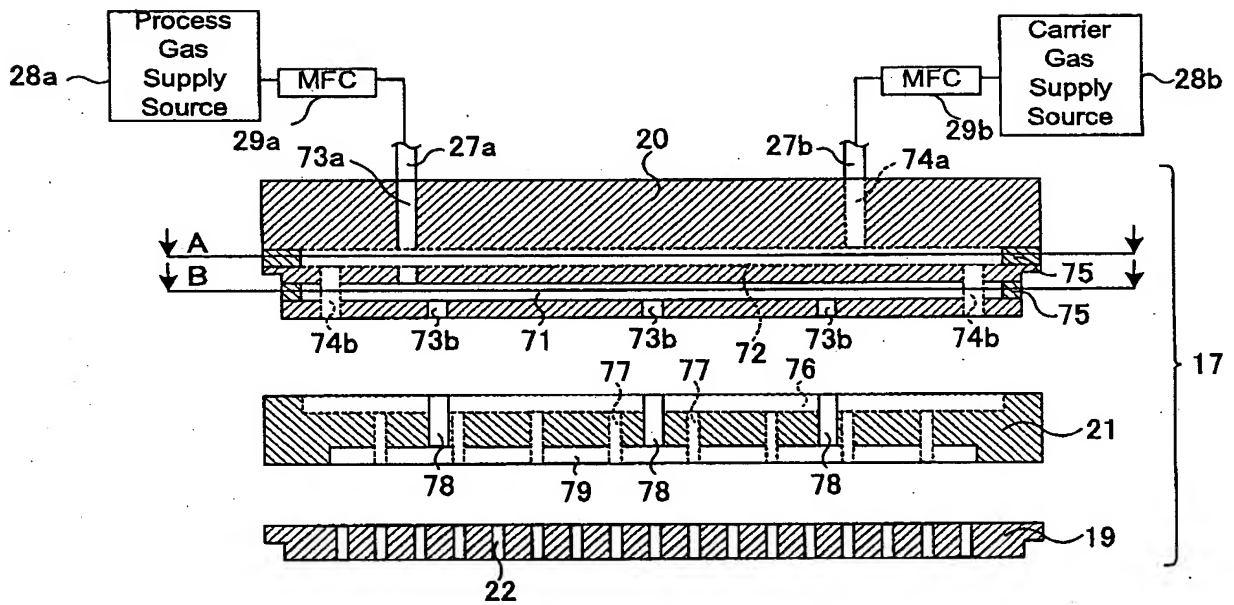
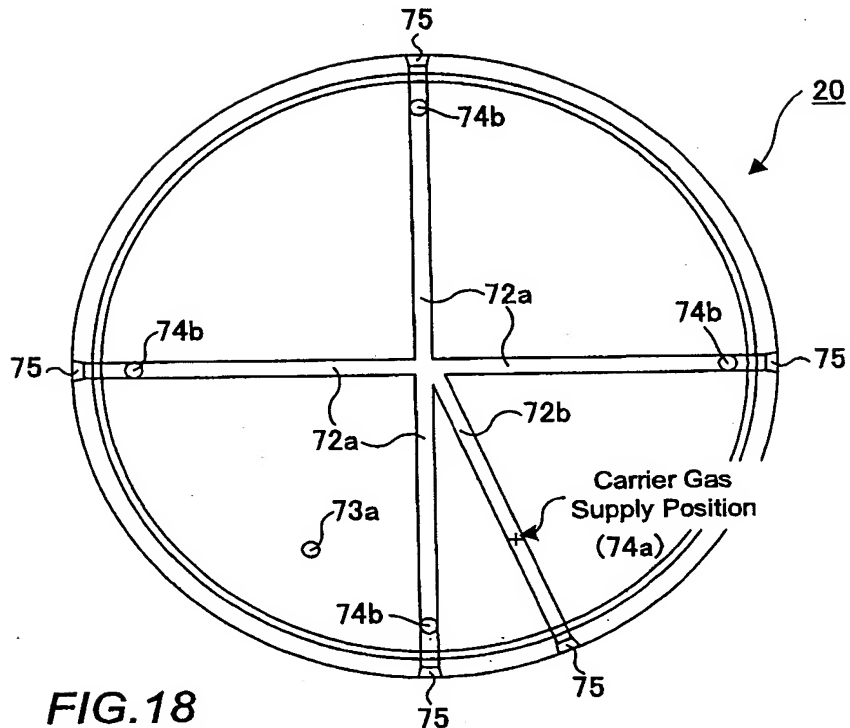
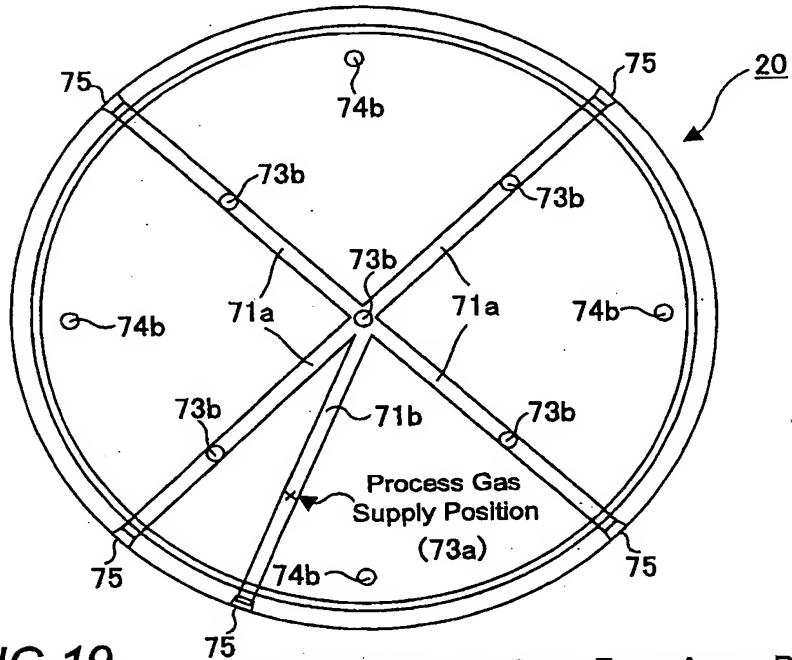


FIG. 17



Cross-Section As Seen From Arrow A



Cross-Section As Seen From Arrow B